

RVK 2012

5 – 6 March 2012,
Stockholm, Sweden

The New UWB Self-grounded Bow-Tie Antennas and the Applications in Different Systems

Jian Yang¹, Ahmed A. Kishk², Aidin Razavi¹, Yinan Yu¹, Tomas McKelvey¹, Borys Stoew³, Shirin Abtahi¹, Stefan Kidborg⁴, Ali Naseer Hashim Al-Rawi¹

¹Dept. of Signals and Systems, Chalmers; ²Dept. of Electrical Engineering, University of Mississippi; ³Imego AB, Gothenburg; ⁴Medfield Diagnostics AB, Gothenburg

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Abstract

Ultra-wideband (UWB) technology finds many applications, such as UWB sensor network, UWB short-range communication systems, UWB radar and imaging systems, and super sensitive UWB radio astronomy. Low-profile directional UWB antennas are strongly demanded in many UWB applications. However, few such UWB antennas have been reported. To meet the demands, we have developed a new low-profile directional UWB antenna, the self-grounded Bow-Tie (SGBT) antenna, at Chalmers University of Technology recently.

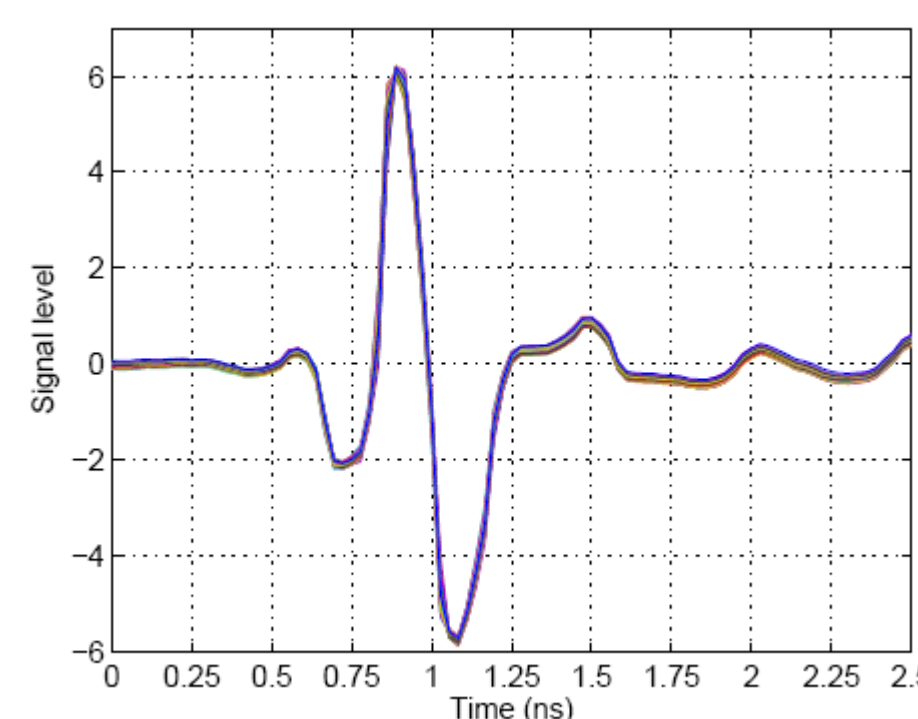
The Self-grounded Bow-Tie (SGBT) Antenna

The SGBT antenna has the following characteristics over an ultra-wide frequency band:

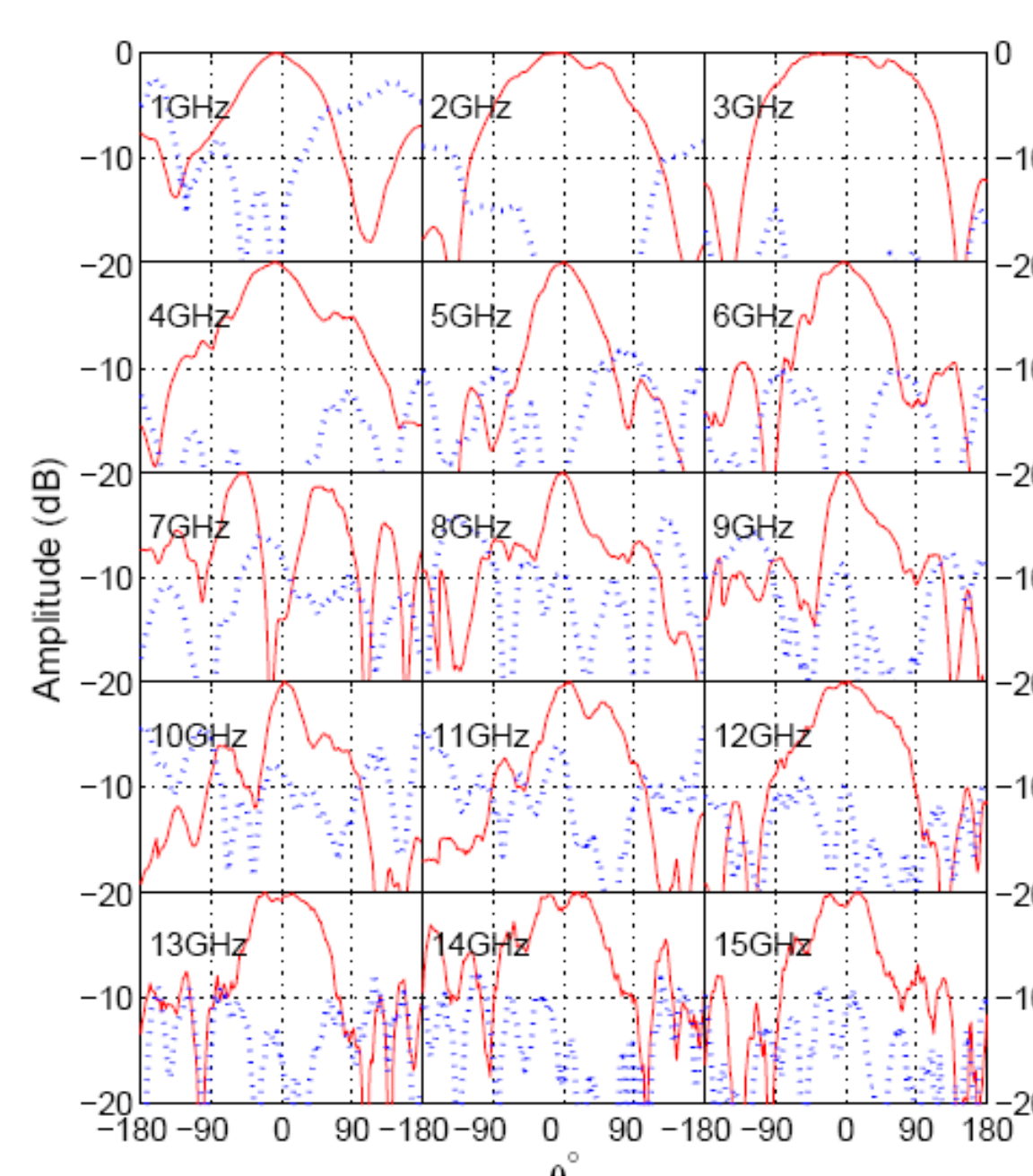
- very good time response;
- compact size and low-profile;
- constant directional radiation beam;
- good reflection coefficient.



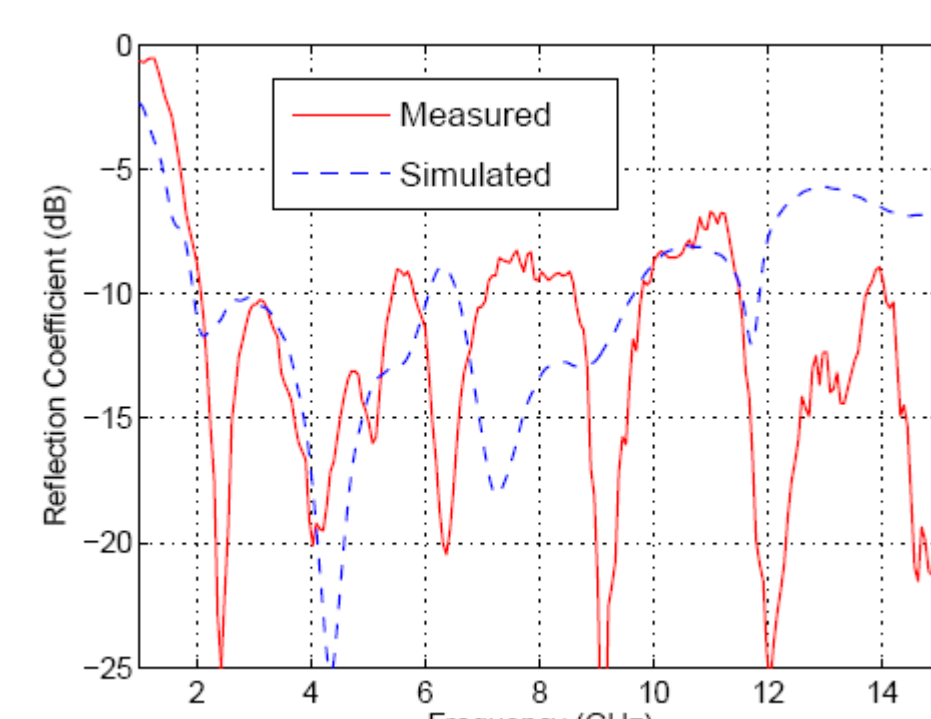
Photo of the antenna



Time-domain impulse response measurement with the two antennas separated by 250 mm



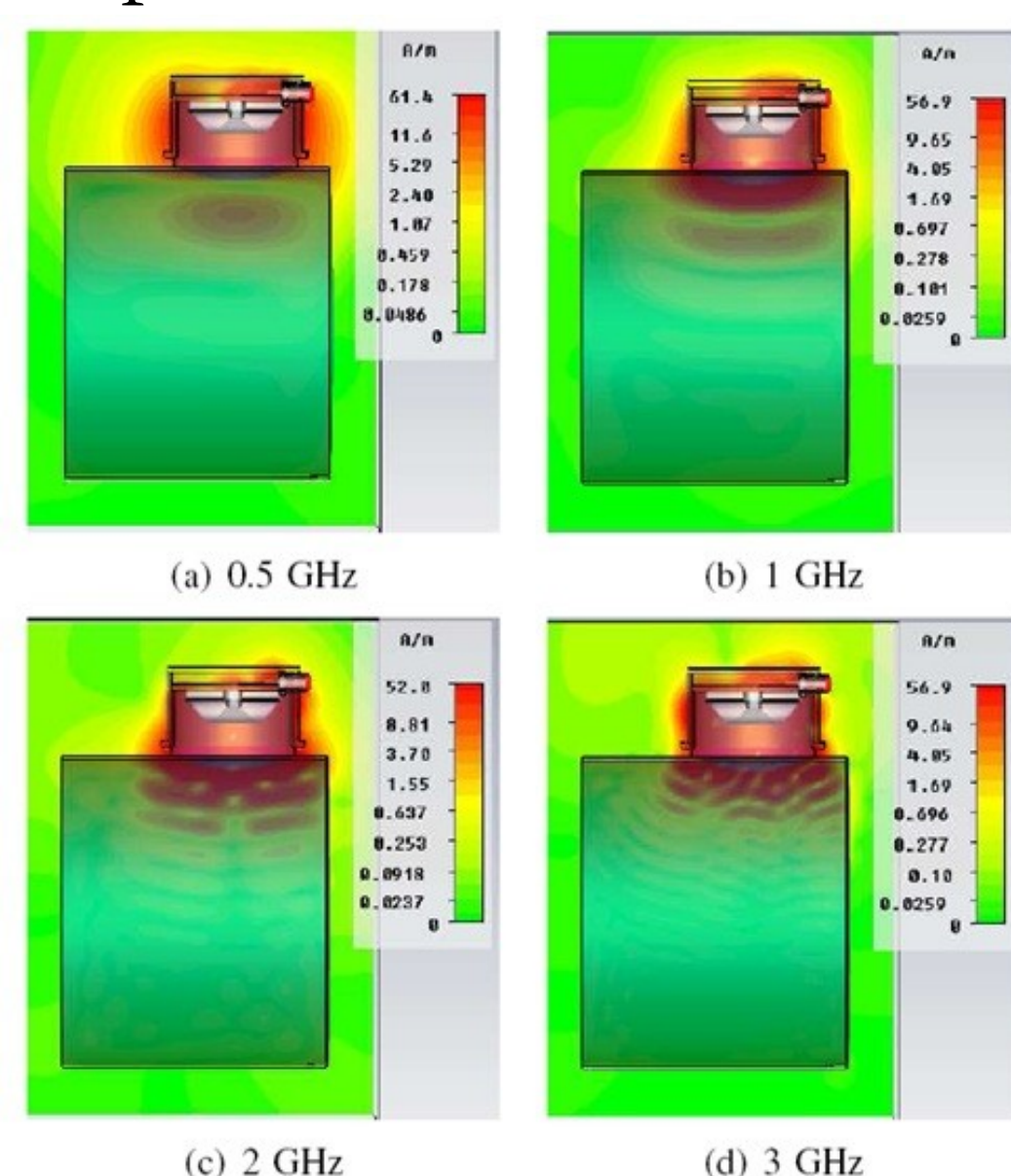
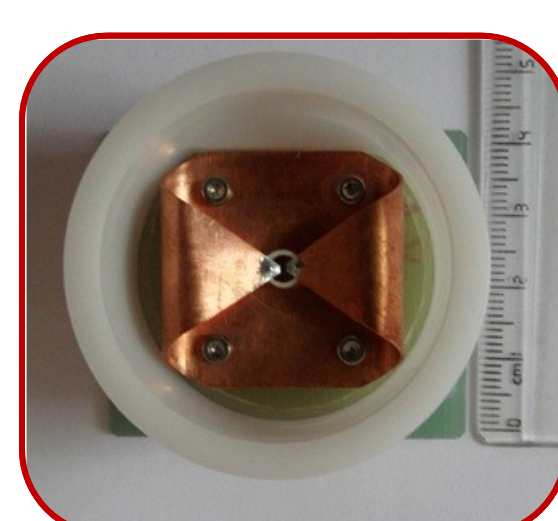
Measured radiation pattern in $\varphi=45$ deg plane



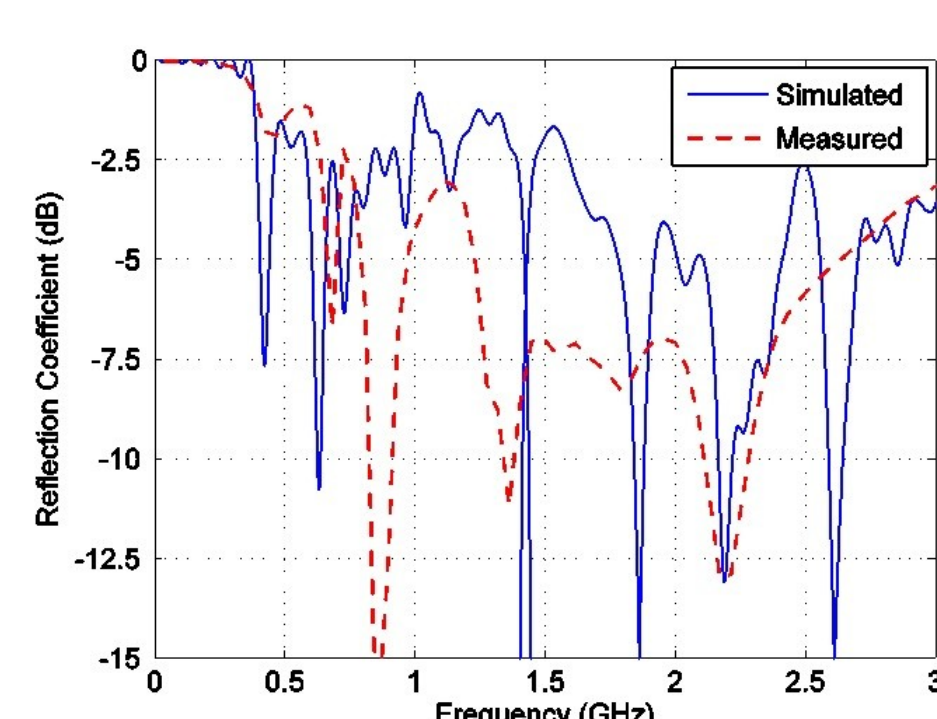
Measured and simulated reflection coefficient

A New Compact Multiband SGBT Antenna For Stroke Diagnosis System Over 0.5-3 GHz

The brain stroke is the third cause of death, ranking only behind heart disease and cancers. The real-time diagnosis is important because of different treatment: the ischemic stroke patients are given thrombolytic treatment which could be fatal for hemorrhagic patients. The multi-band operating systems are preferred due to higher resolution and deeper penetration than narrow band counterparts.



Simulated H-field distribution inside the simple head model by CST



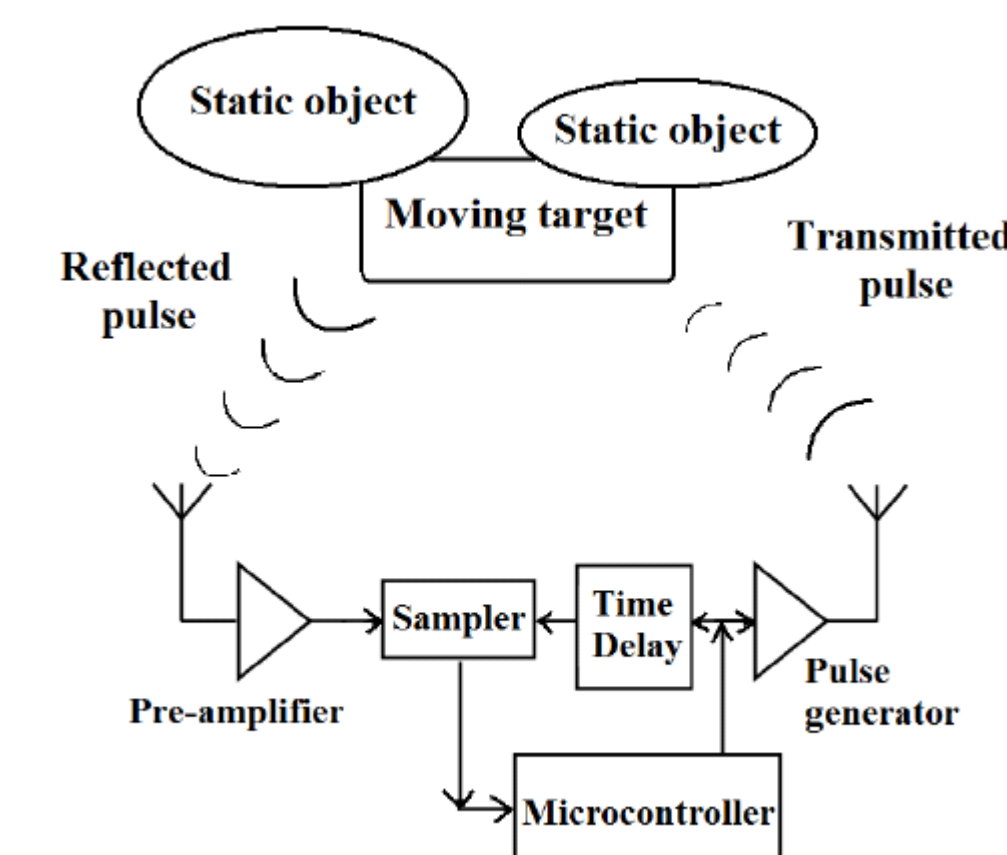
Reflection coefficient

Compact UWB Radar for Indoor Ranging and Tracking

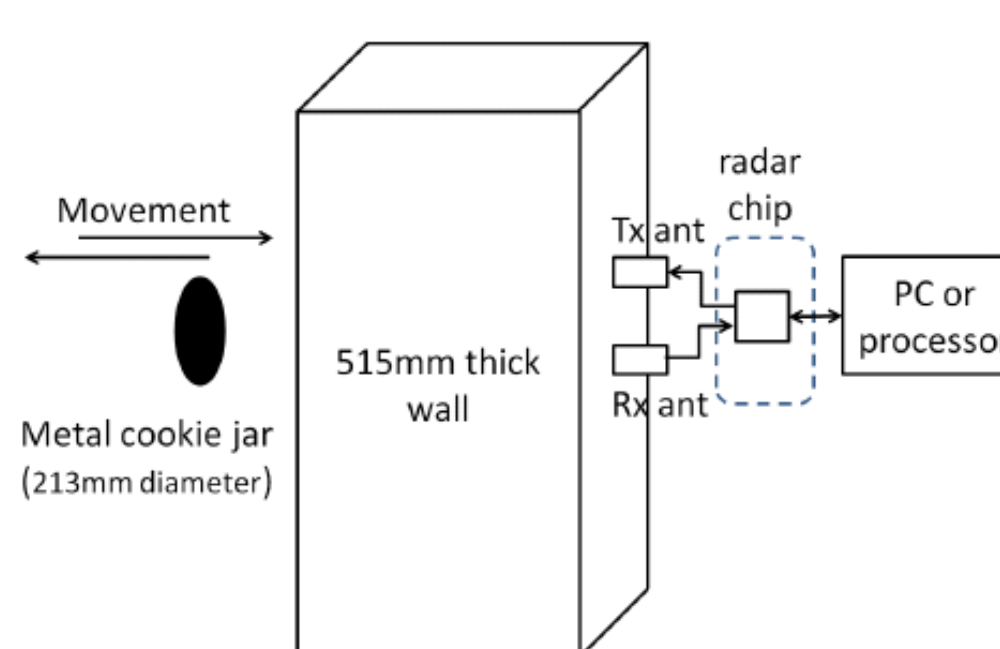
- A compact UWB radar system for indoor-and-through-wall ranging and tracking of moving objects has been built up by using the SGBT antennas and the low cost Novelda transceiver.
- Robust and accurate algorithms for ranging and tracking have been developed.
- The evaluation by measurements shows that the ranging resolution of this UWB system has achieved to 1.4 mm RMS accuracy, and a fast and real-time tracking solution for through-wall radar is obtained.



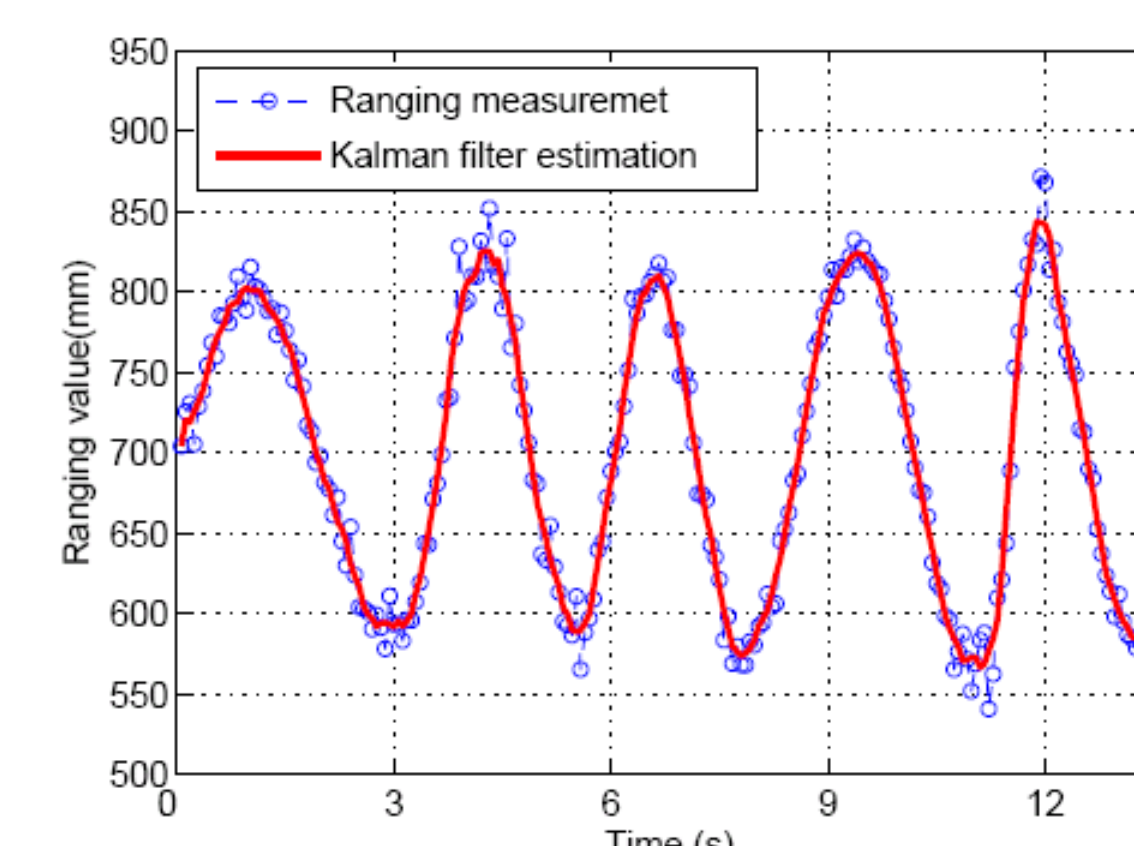
Compact low-cost UWB radar.



Operating principle of the UWB radar

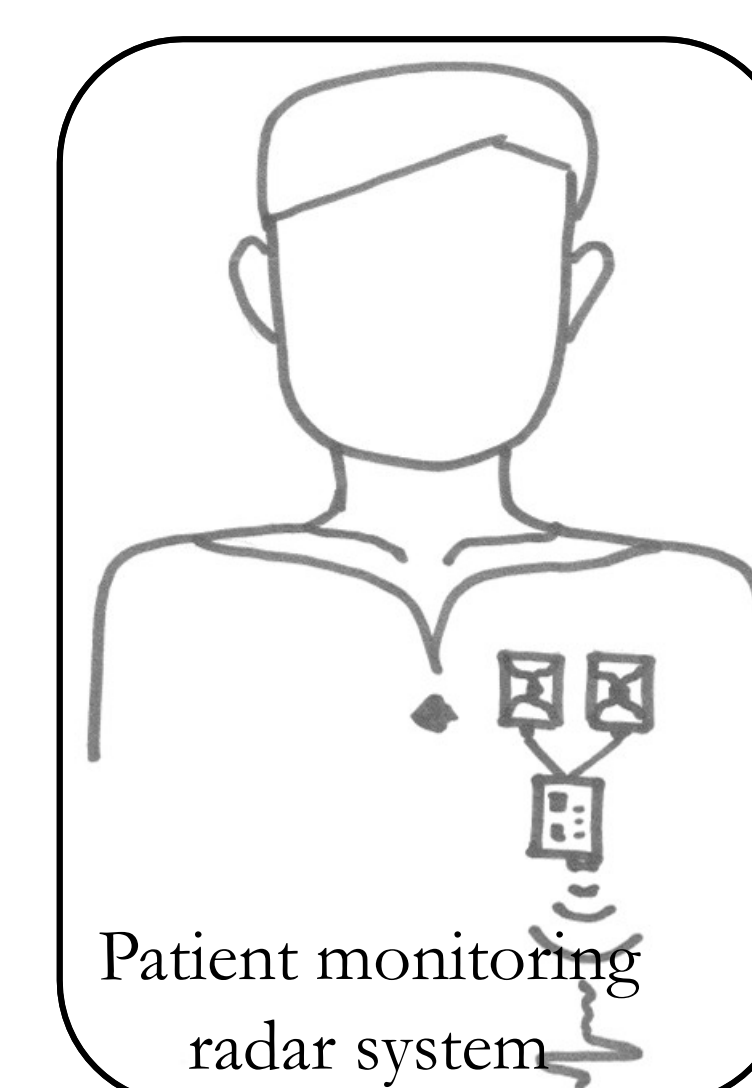
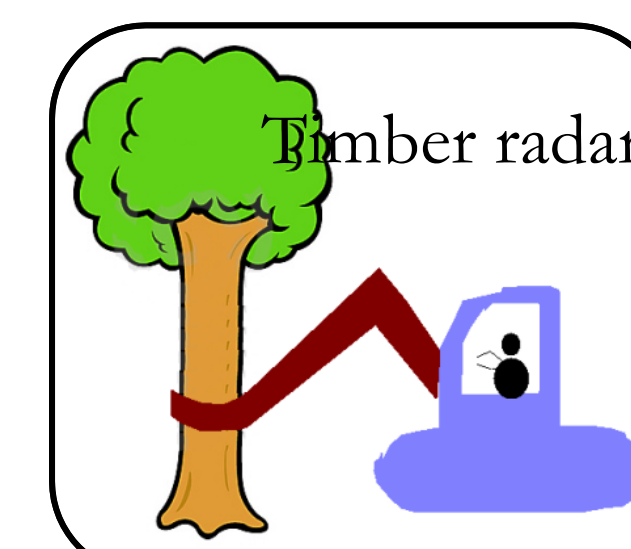
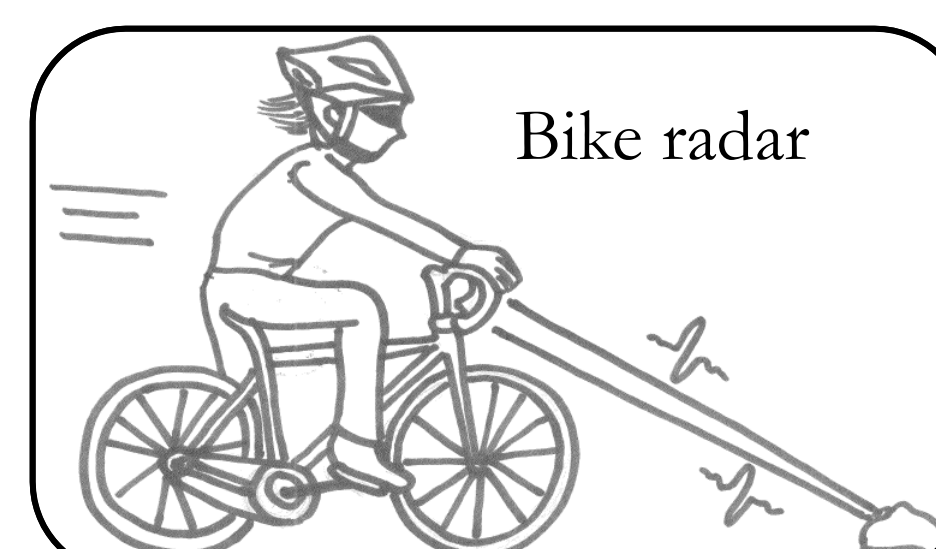
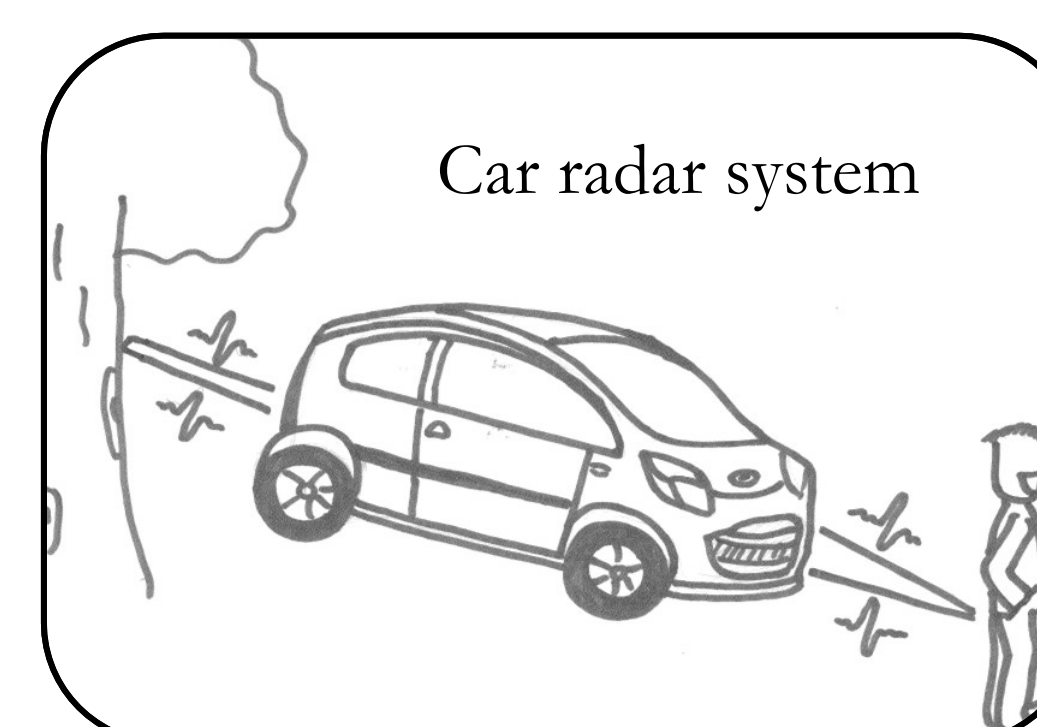


Setup for the evaluation of the tracking algorithm through a wall



Estimated position by the Kalman filter tracking algorithm for the See-through-wall evaluation.

Other Applications



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The self-grounded Bow-Tie antenna is protected by a patent

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